US007389785B2

(12) **United States Patent**
Loudermilk et al.

(10) **Patent No.: US 7,389,785 B2**
(45) **Date of Patent: Jun. 24, 2008**

(54) **STRUCTURAL SUPPORT ASSEMBLY**

(76) Inventors: **William A. Loudermilk**, 1100 Burch Dr., Evansville, Vanderburgh County, IN (US) 47725; **Richard D. Cook**, 1100 Burch Dr., Evansville, Vanderburgh County, IN (US) 47725

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 467 days.

(21) Appl. No.: **11/107,537**

(22) Filed: **Apr. 15, 2005**

(65) **Prior Publication Data**

US 2006/0231128 A1 Oct. 19, 2006

(51) **Int. Cl.**
E04H 15/34 (2006.01)
E04B 7/04 (2006.01)

(52) **U.S. Cl.** **135/121**; 135/144; 135/97; 135/120.3; 52/82; 52/92.1; 52/93.1; 52/646; 403/174; 403/217

(58) **Field of Classification Search** 135/121–123, 135/120.3, 144–146, 87, 97, 159, 160; 403/174–175, 403/169, 217, 92; 52/82–83, 93.1–93.2, 52/643–646, 92.1–92.2, 655.1; 49/381
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

2,723,673	A *	11/1955	Call	135/140
4,347,690	A *	9/1982	Wallace, Jr.	52/93.1
4,726,701	A *	2/1988	Thomas	403/172
4,974,352	A *	12/1990	Shwu-Jen	40/783
5,000,211	A *	3/1991	Speare et al.	135/97
5,335,685	A *	8/1994	Dahulich	135/156
5,526,614	A *	6/1996	Huang	52/13
5,797,695	A *	8/1998	Prusmack	403/170
6,338,226	B1 *	1/2002	Gauthier et al.	52/63
6,345,638	B1 *	2/2002	Warner	135/123
6,758,354	B2 *	7/2004	Carletti	211/189
6,840,698	B2 *	1/2005	Cattaneo	403/170
6,899,112	B2 *	5/2005	Tsai	135/131

FOREIGN PATENT DOCUMENTS

WO	WO 9946456	A1 *	9/1999

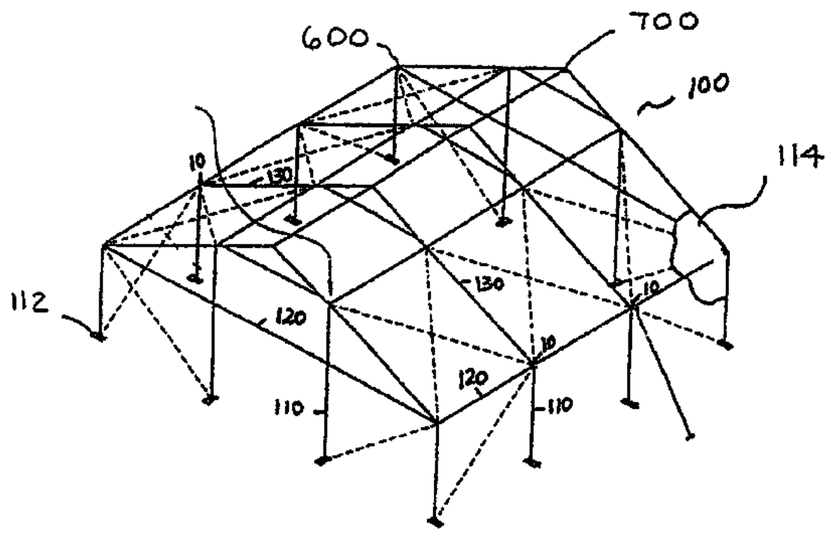
* cited by examiner

Primary Examiner—Winnie Yip
(74) *Attorney, Agent, or Firm*—Gary K. Price, Esq.

(57) **ABSTRACT**

A frame tent system having a plurality of upright columns, a plurality of eave members, and a plurality of rafters. The plurality of members are inter-connected by a system of novel eave weldments. The eave weldment is preferably a four-way connector unit interconnecting the frame members of the tent system at major points of connection to form the frame tent system. The eave weldment is formed of a weldment plate and an insert tube disposed perpendicular to the weldment plate. The frame members of the tent system each include a channel for releasably receiving ends of the eave weldment. In particular, the channel disposed in the rafter receives a first end of the weldment plate; the channel disposed in the upright column receives a second end of the weldment plate; the channel disposed in the eave members receive an end of the insert tube thereby forming the frame tent system.

24 Claims, 8 Drawing Sheets



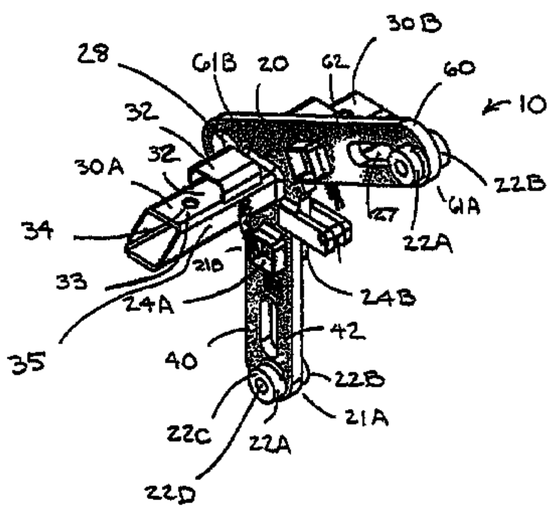


FIG. 1

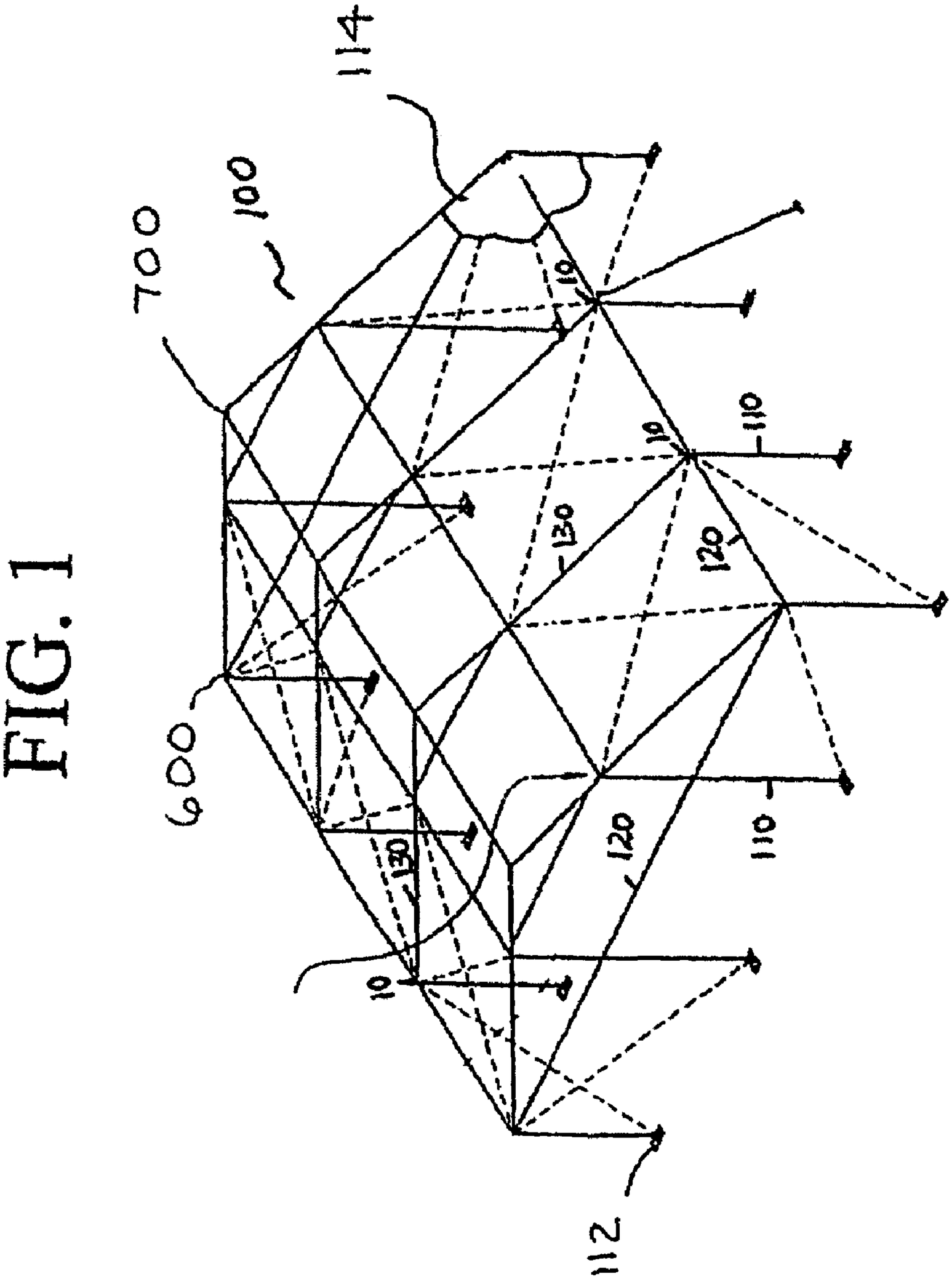


FIG. 2

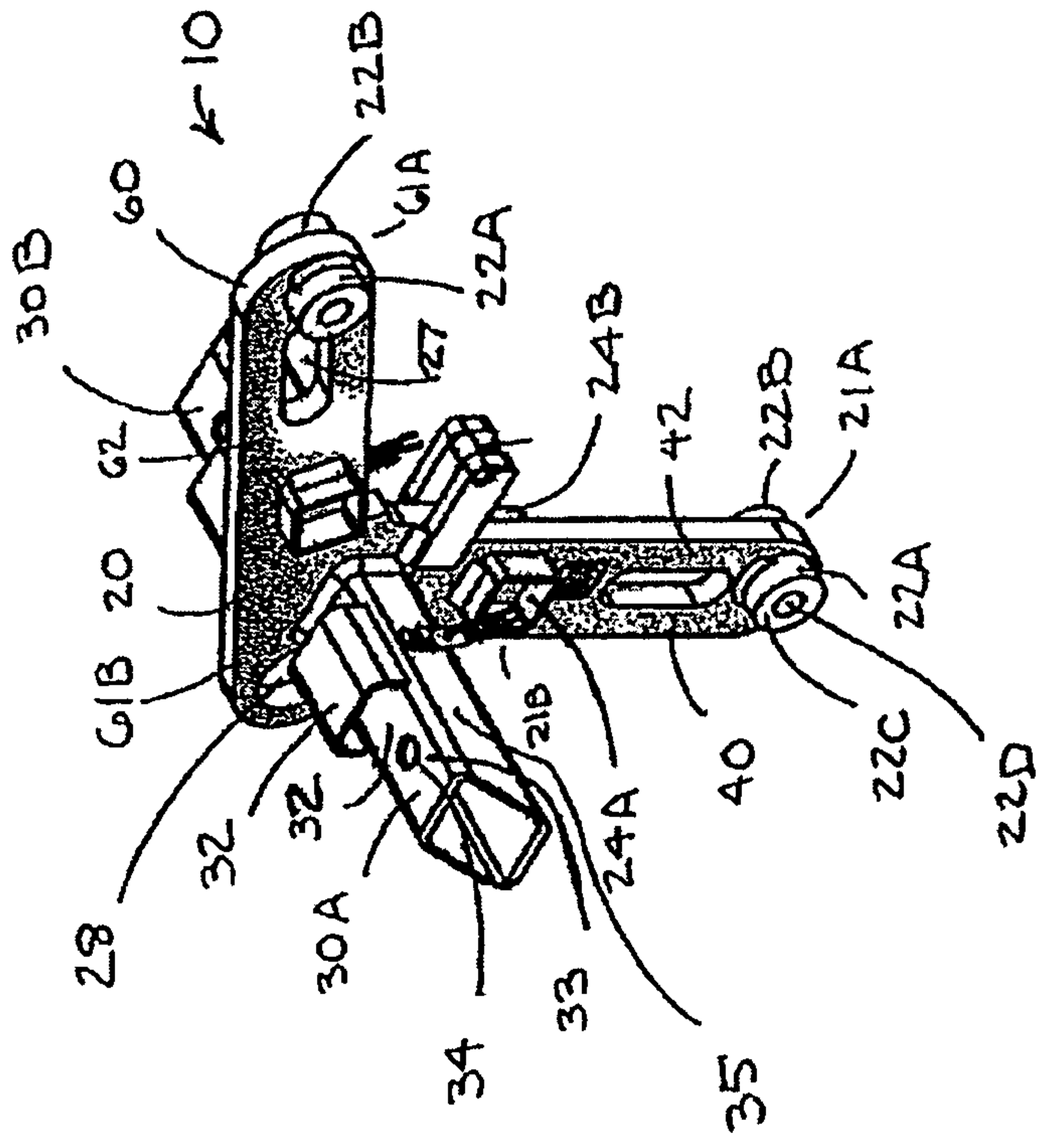

10
22B
61A
60
30B
22A
27
24B
42
22B
21A
62
20
61B
21B
22A
32
32
30A
28
24A
40
22C
22D
33
34
35

FIG. 3

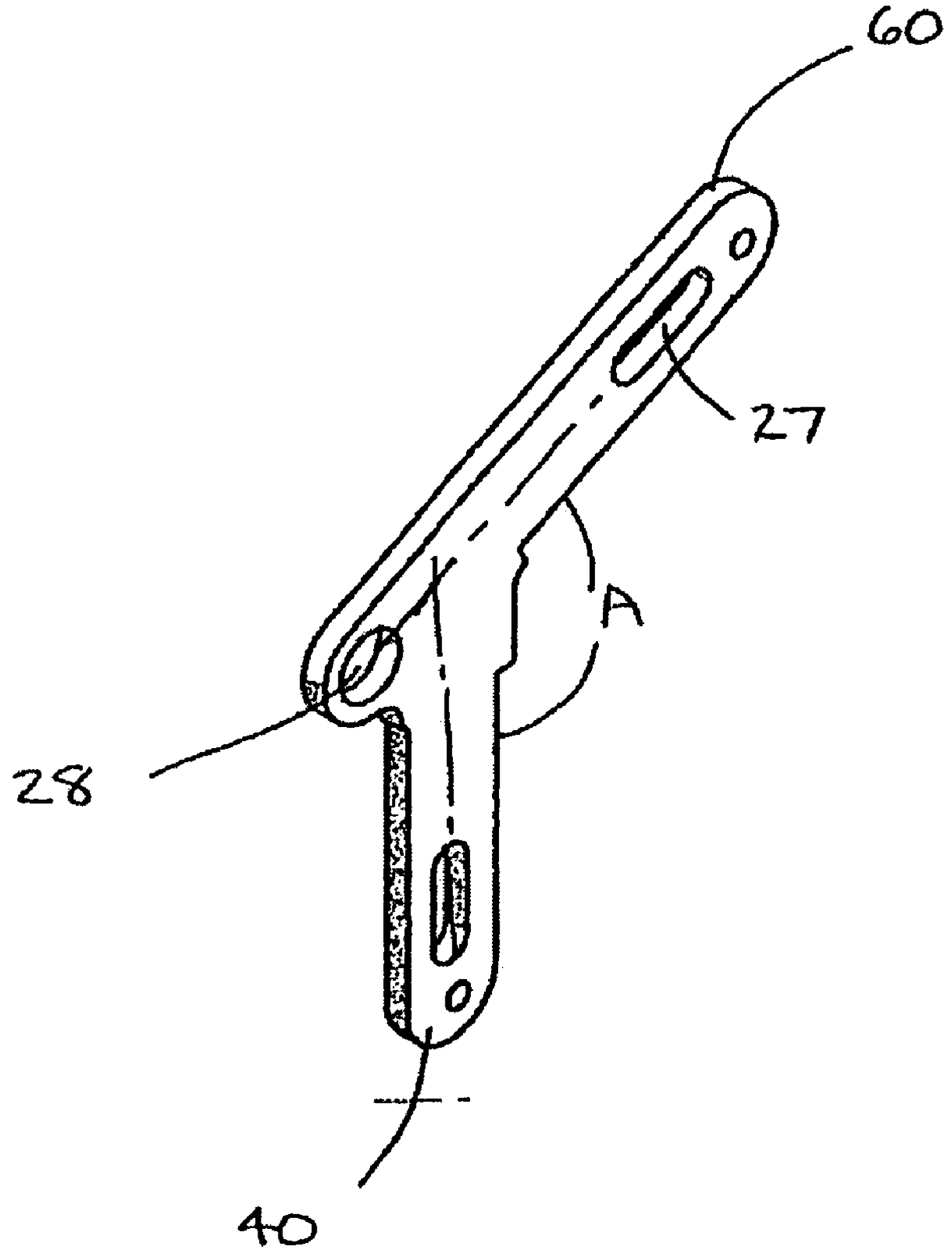


FIG. 4

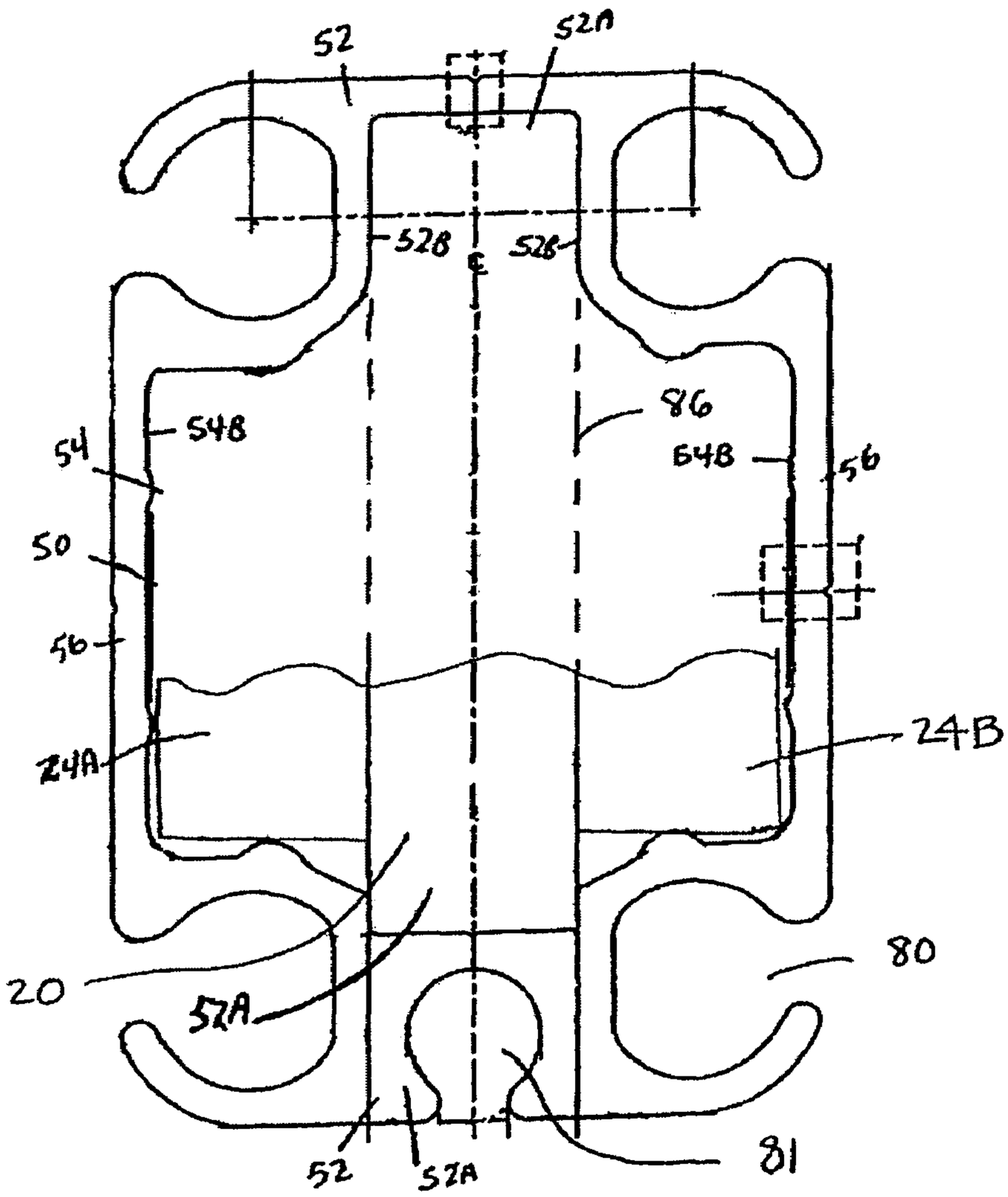


FIG. 5A

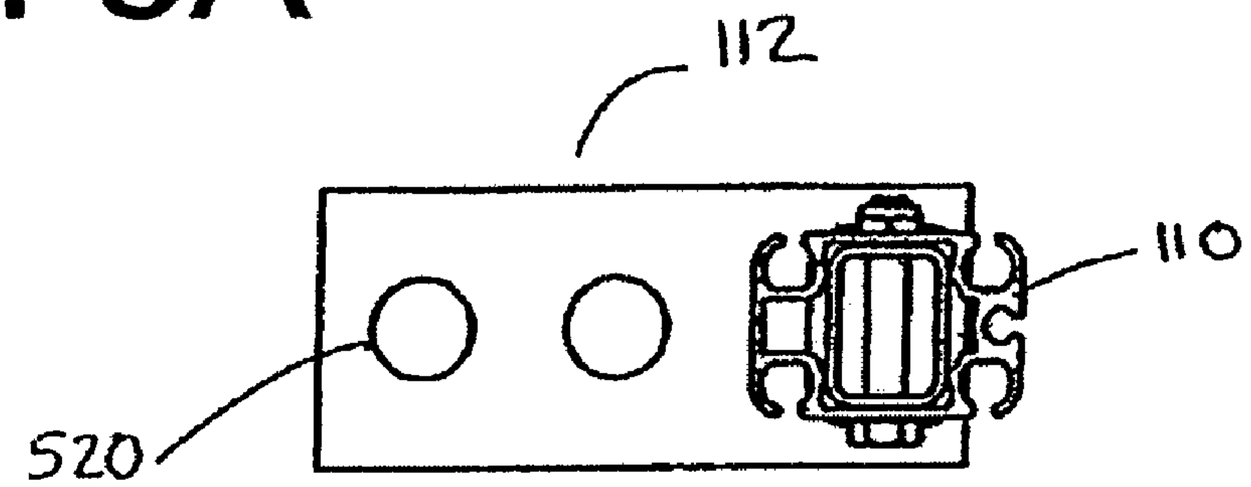


FIG. 5B

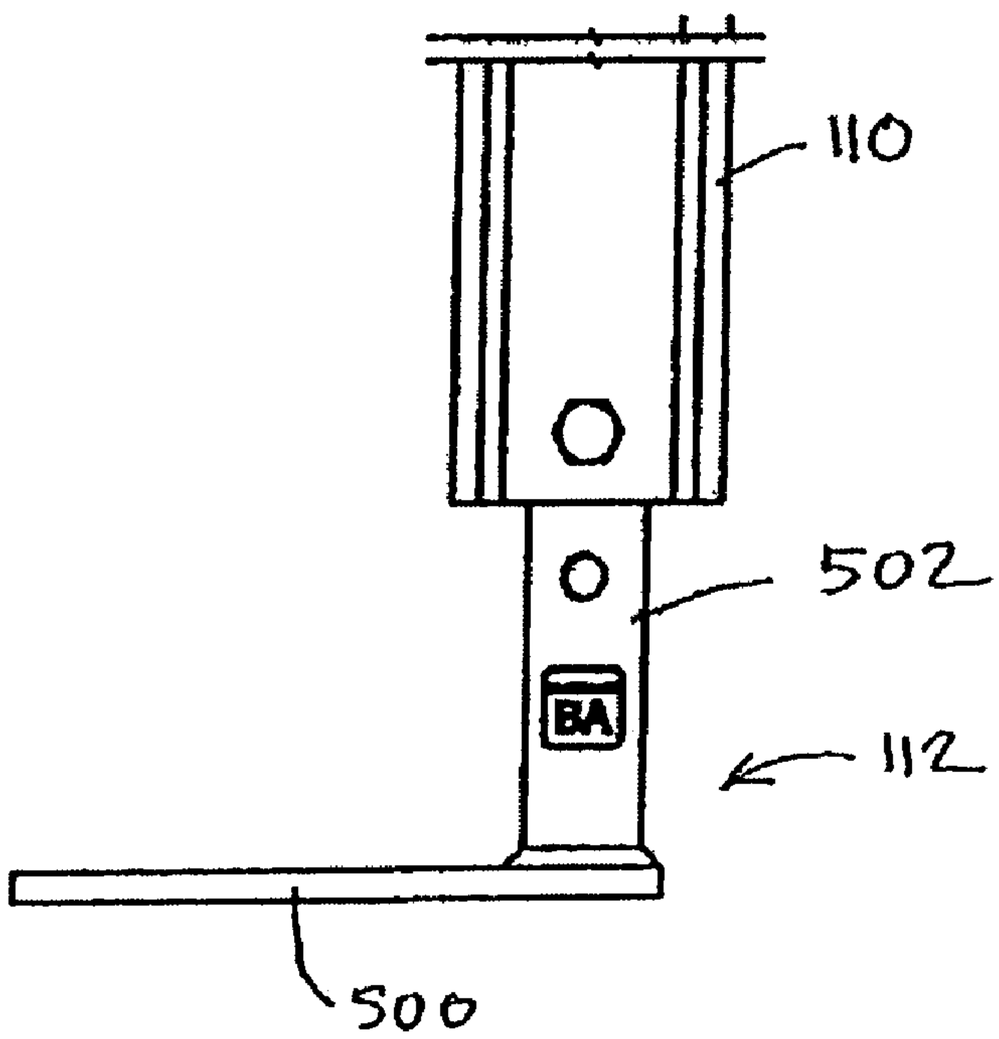


FIG. 6

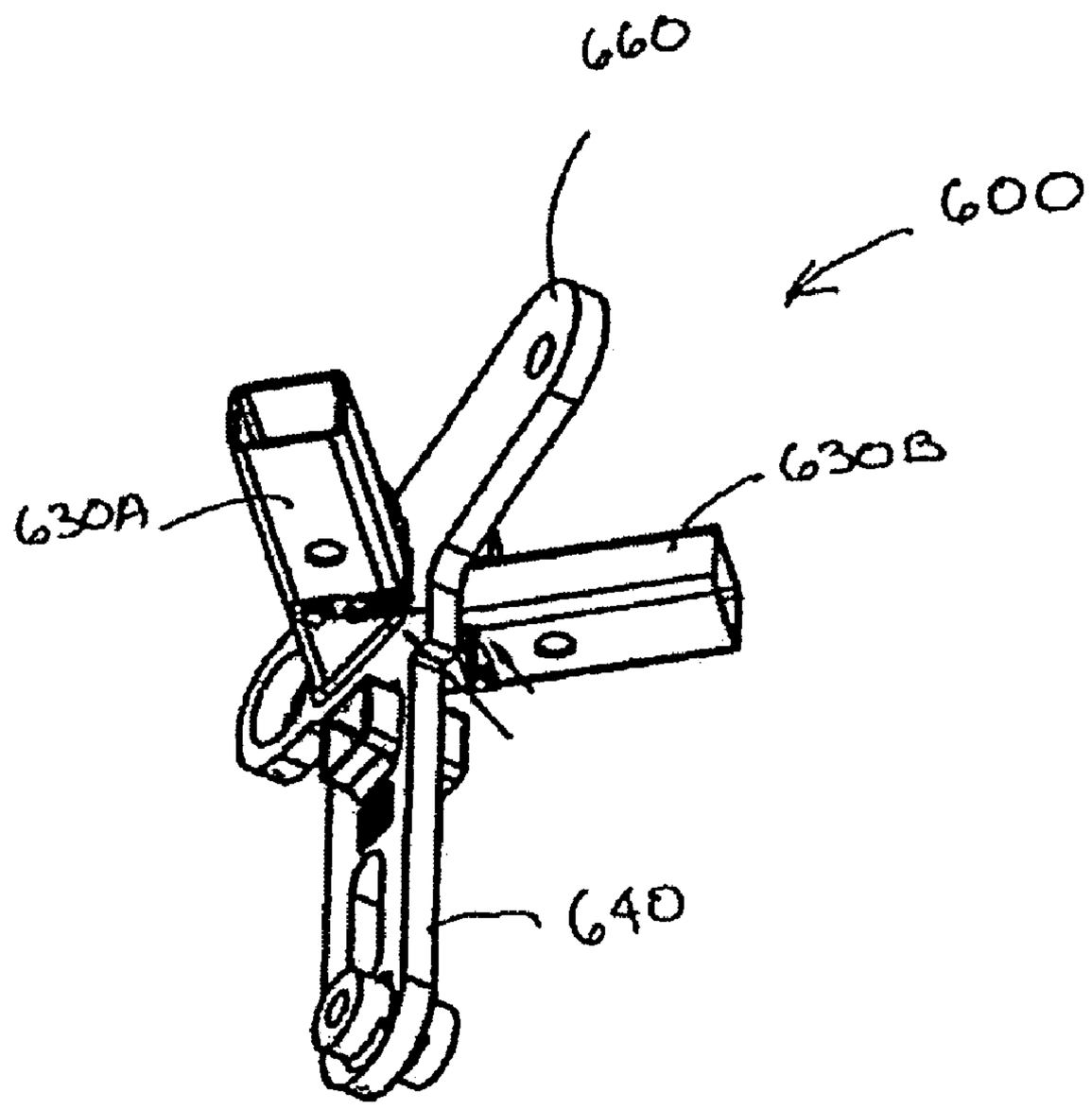


Fig. 7A

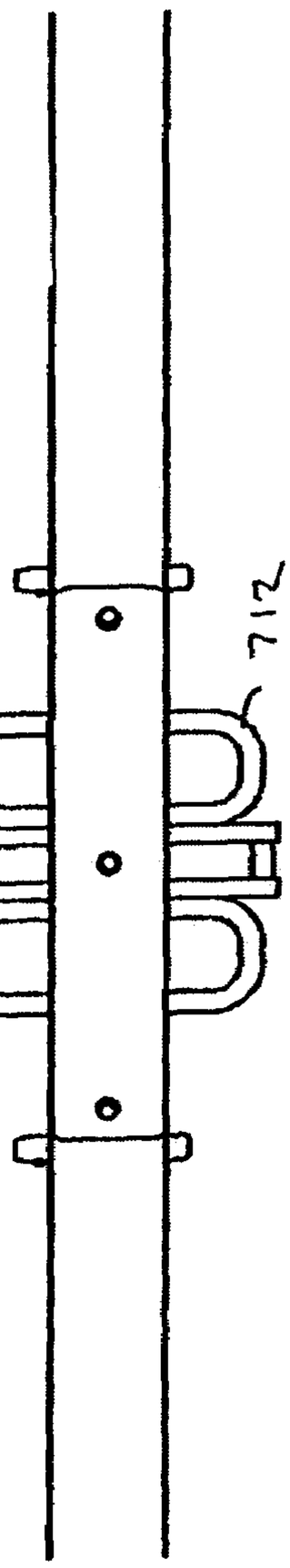
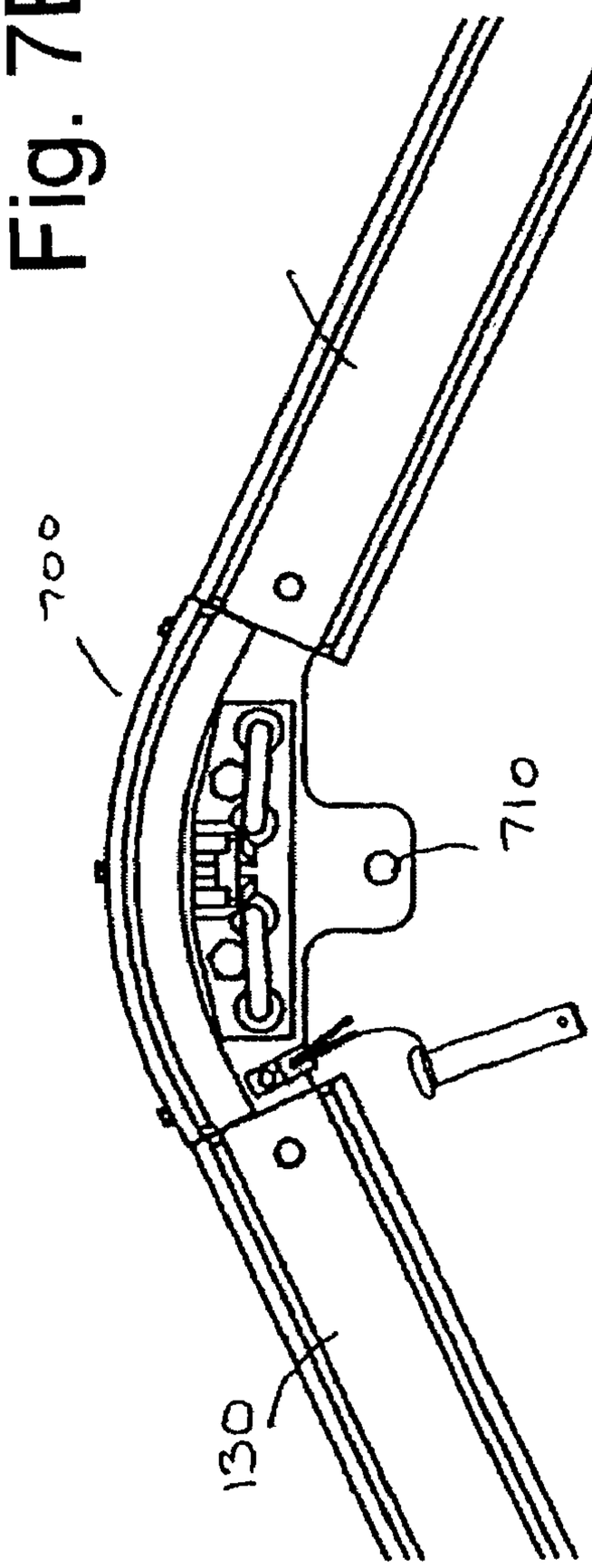


Fig. 7B



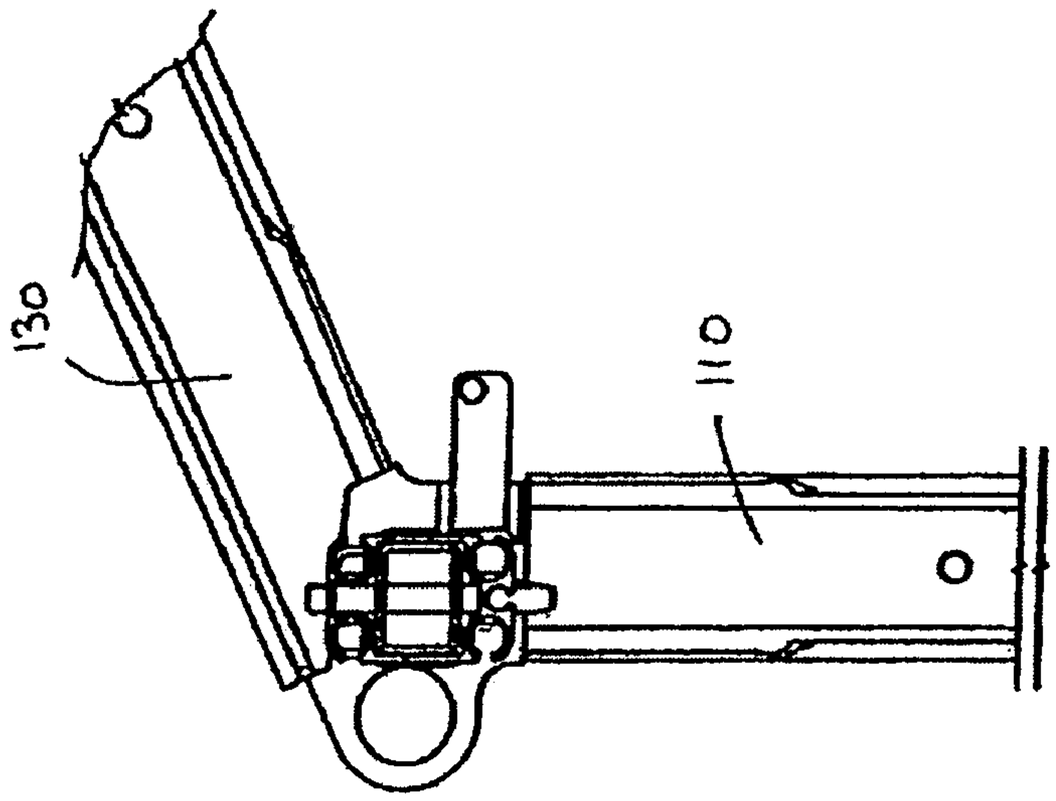


FIG. 8B

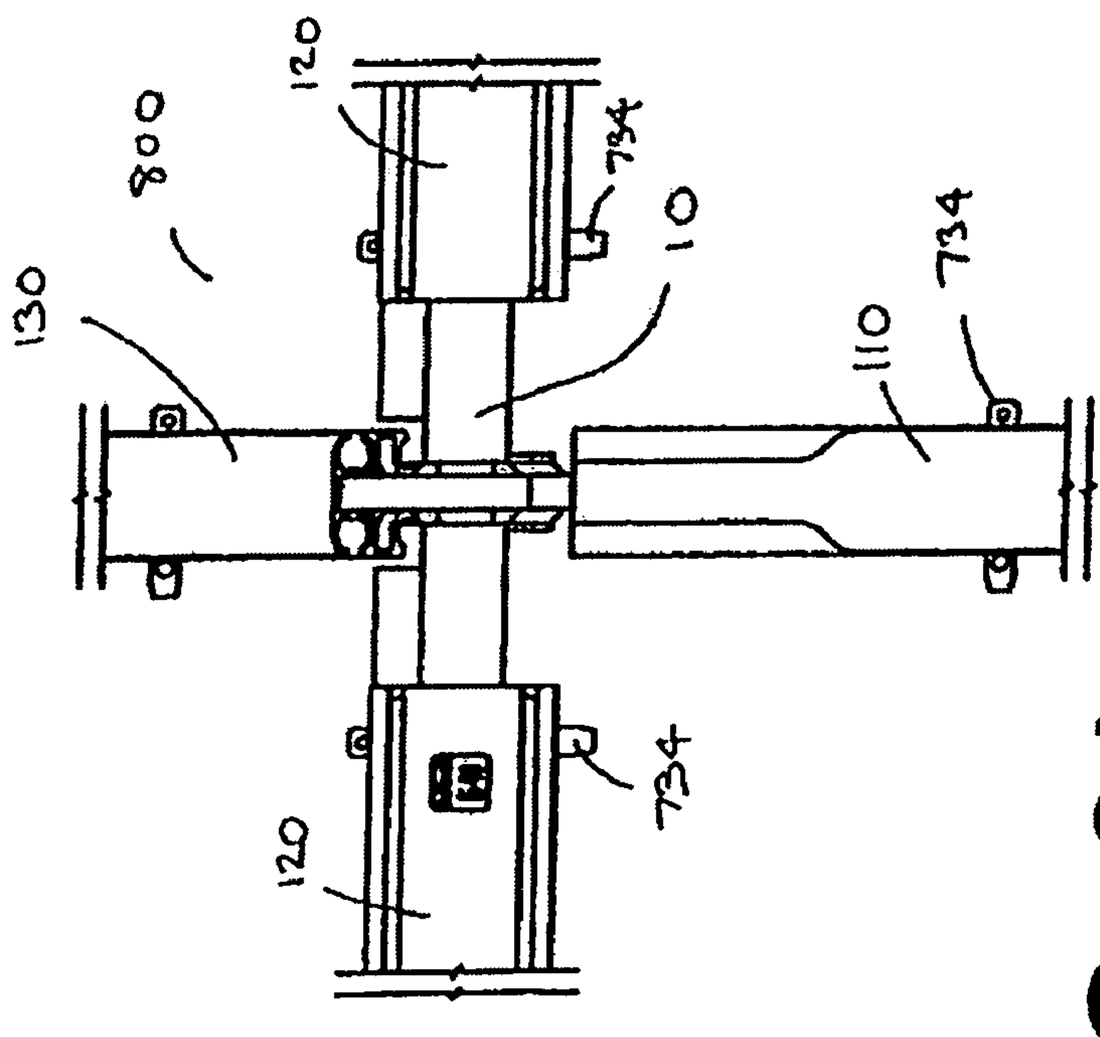


FIG. 8A

STRUCTURAL SUPPORT ASSEMBLY

CROSS REFERENCES TO RELATED APPLICATIONS

None.

STATEMENT AS TO RIGHTS TO INVENTIONS MADE UNDER FEDERALLY SPONSORED RESEARCH AND DEVELOPMENT

Not Applicable

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates generally to the construction and assembly of temporary shelters such as frame tent systems, and more particularly relates to a structural support assembly used in the erection and support of the tent system.

2. Brief Description of Prior Art

Conventional tent systems, canopy frame structures, canvas shelters and the like of a readily assemblable and disassemblable nature such as utilized in the rental trade are commonly made up of cylindrical tubing and various types of junction elements or connectors. To assemble a given desired structure, it is conventional to join upright columns, eave members, and rafters with various types of junction elements or connectors. Fabric is then installed over the frame to enclose the tent structure.

The prior art in the field of tents and temporary shelters yields a variety of tent frame assemblies suitable for use in widely different situations. The circumstances of intended use largely determine the structural features to be included in or eliminated from the tent design. For example, tents employed by backpackers, should be of simple construction, preferably having lightweight components which may be connected without the need for tools or complicated hardware. In contrast to the foregoing, tents to be used at carnivals or exhibits are exposed to greater stresses over a longer period of time, but must nonetheless provide a stable shelter over a large area. Accordingly, frames for these tents generally feature heavier rigid columns linked together with eave members by reinforced connecting means. In the past, the assembly procedure for larger structures has been complicated and time-consuming.

There is a demand for a frame tent system that provides maximum shelter at a minimum weight, and further provides for simpler and quicker tent installation.

As will be seen from the subsequent description, the preferred embodiments of the present invention are improvements over existing structure support assemblies such as used in canvas shelters.

SUMMARY OF THE INVENTION

The principal feature and advantage of the present invention is an eave weldment of unique design for assembly and disassembly with the upright columns, eave members and rafters in forming the frame tent system. The columns, eave members and rafters include extruded channels for interconnecting with the designed eave weldments. The system is designed and configured with a maximized strength-to-weight ratio and can be readily fabricated by extrusion from high strength aluminum alloy or the like.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a perspective view of a frame tent system.

FIG. **2** is a perspective view of an eave weldment of the system of FIG. **1**.

FIG. **3** is a perspective view of a weldment plate of the eave weldment of FIG. **2**.

FIG. **4** is an end view of a structural member that receives the eave weldment of FIGS. **2** and **3**.

FIGS. **5**A and **5**B show details of a foot portion of the frame tent system.

FIG. **6** is a perspective view of a corner eave weldment.

FIGS. **7**A and **7**B show ridge weldment details.

FIGS. **8**A and **8**B show details of a connection making up a portion of the frame tent system.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

In accordance with the present invention, a structural support assembly is disclosed. The structural support assembly is directed to an improved structural support assembly designed and configured with a maximized strength-to-weight ratio that can be readily fabricated by extrusion from high strength aluminum alloy or the like, and provides for simpler and quicker tent installation. In particular, the present invention is an eave weldment of unique design for assembly and disassembly with the upright columns, eave members and rafters and forming the frame tent system. In the broadest context, the structural support assembly consists of components configured and correlated with respect to each other so as to attain the desired objective.

First referring to FIG. **1**, and as known in the art, in accordance with the present invention, a frame tent system **100** is disclosed. Referring to FIG. **1**, and as known in the art, the tent frame **100** is formed of a plurality of generally vertical upright columns **110**, a plurality of generally horizontal eave members **120**, and a plurality of rafters **130**. The tent system **100** can have a cover **114** shown mostly cut away for clarity. The cover can be of any suitable material such as canvas or nylon for example. The tent system **100** can include connectors such as eave weldments **10**, corner eave weldments **600** (see FIG. **6** for detail) and ridge weldments **700** (see FIG. **7** for detail).

Referring to the drawings, and in particular FIG. **1**, the plurality of members **110**, **120** and **130** are interconnected by a system of novel eave weldments **10**, **600** and **700** into a large yet stable structure. Frame tent system **100** is most clearly defined by a consideration of the eave weldments **10** with frame members **110**, **120** **130** at major points of connection. As will be described here and below in greater detail, the eave weldments **10** unite an arrangement of frame members including the upright columns **110**, eave members **120**, and rafters **130**. In this regard, the frame members **110**, **120** and **130** each include a channel **50** for releasably receiving the eave weldment **10** and other weldments **600** and **700**.

As shown in FIG. **2**, the eave weldment **10** is preferably a four-way connector unit that ridgedly yet releasably interconnects the upright columns **110**, the eave members **120**, and the rafters **130** at common locations along the frame tent system **100**, and further includes means for adjustably anchoring the system **100**. The eave weldment **10** is formed of a weldment plate **20** (best shown in FIG. **3**) and preferably a pair of insert tubes **30**A, **30**B attached to the sides of the weldment plate **20** in perpendicular relationship to first and second ends **40** and **60** that define the weldment plate **20**.

The weldment plate **20** can be steel plate having a thickness of ⅝ inch for example and having a generally L-shaped

configuration comprising the first end **40** and the second end **60**. In the preferred embodiment, the ends **40**, **60** each having a pair of bushings **22**A, **22**B and a pair of spacers **24**A, **24**B projecting therefrom. As shown in FIG. **3**, there is an angle "A" between ends **40** and **60**. For example, angle "A" could be in the range of 100-135 degrees. The angle "A" determines the pitch of the roof of the frame tent system **100**.

In particular, the first end **40** having one of the pair of bushings **22**A projecting from a first side **42** of the end **40**, and the second of the pair of bushings **22**B projecting from a second side **44** of the end **40**, such that the bushing **22**A is serially aligned with bushing **22**B. It being critical that the bushings **22**A, **22**B be disposed at a location **21**A along the length of the first end **40**, that location **21**A at the approximate midway of the length of the first end **40**. Likewise, the first end **40** having one of the pair of spacers **24**A projecting from the first side **42** of the end **40**, and the second of the pair of spacers **24**B projecting from the second side **44** of the first end **40**, such that the spacer **24**A is serially aligned with spacer **24**B. It being critical that the spacers **24**A, **24**B be disposed at a location **21**B of the first end **40**, that location **21**B being at an approximate end **45** of the first end **40**.

The second end **60** having one of the pair of bushings **22**A projecting from a first side **62** of the end **60**, and the second of the pair of bushings **22**B projecting from a second side **64** of the end **60**, such that the bushing **22**A is serially aligned with bushing **22**B. It being critical that the bushings **22**A, **22**B disposed at a location **61**A along the length of the second end **60**, that location **61**A at the approximate midway of the length of the second end **60**. Likewise, the second end **60** having one of the pair of spacers **24**A projecting from the first side **62** of the end **60**, and the second of the pair of spacers **24**B projecting from the second side **64** of the end **60**, such that the spacer **24**A is serially aligned with spacer **24**B. It being critical that the spacers **24**A, **24**B be disposed at a location **61**B of the end **60**, that location **61**B being at an approximate end **65** of the second end **60**.

The bushings **22**A, **22**B and spacers **24**A, **24**B are preferably of cylindrical configuration having flattened end surfaces **22**C. The bushings **22**A, **22**B include central holes **22**D that receive dowel pins that releasably connect members **110**, **120**, **130** to weldments **10**, **600**, **700**. Spacers **24** can be tubular sections with flat ends.

As should be appreciated, the eave weldment **10** is symmetrically constructed and can include an insert tube **30**A and **30**B welded on opposite sides of the weldment plate **20**. The insert tubes **30**A, **30**B generally in perpendicular relationship to the first and second ends **40**, **60** that define the weldment plate **20**. As such, only the insert tube **30**A found on one side of the weldment plate **20** is primarily discussed herein. It should be understood that the insert tube **30**B is identical to those described above, with the exception that the other insert tube **30**B represents a mirror image of the insert tube **30**A described.

The insert tube **30**A includes a stop **32** disposed on a surface **33** of the insert tube **30**A. It being critical that the stop **32** be disposed at a location **32**A along the length of the insert tube **30**A. A pair of pin holes **34** is further disposed through the surface **33** at approximate opposite ends of the insert tube **30**.

Cable connected dowel pins **734** (see FIGS. **7** and **8**) or similar fastening means for insertion into the pin hole **34** is preferably attached to a side surface **35** of the insert tube **30**A.

The weldment plate **20** further includes plate apertures **27**, and a tie down clearance **28** tie-down and for anchoring the system **100**.

Assembly of the frame system of the present invention is similar to assembly of prior art tent frames. As shown in FIG. **1**, the design of each eave weldment **10** of the present invention is to join a pair of eave members **120**, and a rafter **130**, and an upright column **110** at major points of connection to form the tent frame **100** shown.

An end of eave member **120** receives one of the ends of the insert tube **30**A or **30**B disposed concentrically therein, and is securely retained by one of the dowel pins inserted through the pin hole **34**. In application, the stop **32** serve as locator stops so when an eave member **120** is installed over an end of the insert tube, one of the cable connected dowel pins can be inserted through the pin hole **34** and through a hole (not shown) of the eave member **120** in alignment with the pin hole **34**, securing the eave member **120** in place.

An end of the rafter **130** receives the end **60** of the weldment plate **20**. The bushings **22**A, **22**B and the spacers **24**A, **24**B of the end **60** of the weldment plate **20** are slidingly received within the channel **50** (as will be further described) of the rafter **130**. When received, the bushings **22**A, **22**B and spacers **24**A, **24**B are in communication with the interior surface of the rafter **130** so that the end **60** of the weldment plate **20** is frictionally received and therefore releasably secured within the rafter **130**.

An end of the upright column **110** receives the end **40** of the weldment plate **20**. The bushings **22**A, **22**B and the spacers **24**A, **24**B of the end **40** of the weldment plate **20** are slidingly received within the channel **50** of the upright column **110**. When received, the bushings **22**A, **22**B and spacers **24**A, **24**B are in communication with the interior surface of the column **110** so that the end **40** of the weldment plate **20** is frictionally received and therefore releasably secured within the upright column **110**.

The frame members **110**, **120**, **130** of the system **100** each include a pair of ends (not shown) having openings that define the channel **50**. The channel **50** adapted to receive the components of the eave weldment **10** namely, the insert tubes **30**A, **30**B, the first end **40** of the weldment plate **20** and the second end **60** of the weldment plate **20** as discussed above, such that the connecting members of the eave weldment **10** and the frame members **110**, **120** and **130** are substantially in end-to-end relation to one another to form the frame tent system **100**.

Referring to FIG. **4**, the design of the channel **50** of each of the frame members **110**,**120**,**130** is displayed, the channel **50** adapted to receive the eave weldment **10** as discussed above, such that the connecting members of the eave weldment **10** and the frame members **110**, **120**, and **130** are substantially in end-to-end relation to one another to form the frame tent system **100**. The channel **50** can be a common cross section of each frame member **110**, **120**, **130** such that each frame member **110**, **120**, **130** can be formed by extrusion of aluminum or pultrusion of fiberglass for instance.

The channel **50** includes a pair of end sections **52** each defining a first inside width **52**A that defines a generally rectangular opening (indicated by dashed lines **86**, end section **52** and plate **20**) that is less than a second inside width **54**A disposed at a center of wider rectangular section **54** of the channel **50**. In application, when the channel **50** receives the first end **40** of the weldment plate **20** for example, the first end **40** is received so that the bushings **22**A, **22**B and then the spacers **24**A, **24**B are received by the section **54** of the channel **50**. When received, the flattened end surfaces **22**C of the bushings **22**A, **22**B and spacers **24**A, **24**B are in frictional communication with the interior surfaces **54**B of the section **54** so that the first end **40** of the weldment plate **20** is frictionally received therein. The spacers **24**A, **24**B and plate end **40**

are shown, partially cut away, engaged in channel **50** in FIG. **4**. The width **52**A is generally the same as the width of the plate **20** and the width **54**B is generally the same as the width of the plate **20** plus spacers **24**A, **24**B. The width **54**B is further generally the same as the width of the insert tube **30**A for example, designated "W**1**" on FIG. **2**. It is understood that when the channel **50** receives the first end **40** of the weldment plate **20** for example as discussed above, the first end **40** is securely received within the pair of widths **52**A. The weldment plate can be designed without bushings and spacers. As such, without inclusion of the bushings and spacers as discussed above, the channel **50** receives the ends of the weldment plate **20** securely within the pair of widths **52**A.

When the channel **50** receives one of the insert tubes **30**A for example, the insert tube **30**A is received within the channel **50** until the stop **32** of the insert tube **30**A abuts a side end **56** of the channel **50**. The width "W**1**" of the insert tube **30**A sized to be frictionally received within the width **54**B of the channel **50**. The insert tube **30**A is then securely retained within the channel **50** by inserting a dowel pin through the pin hole **34** of the insert tube **30**A and through a hole (not shown) of the frame member. As known in the art, the grooves **80**, **81** in channel **50** can be used to secure the cover **114** to the outside of the frame tent system **100** or to secure material (not shown) to the inside of the frame tent system **100**.

FIGS. **5**A and **5**B show the adjustable base plate **112**. The adjustable plate **112** can include a foot **500** and shaft **502**. The shaft **502** can insert into the channel **50** of the upright column **110**. The shaft **502** can include a series of holes **506** and a fastener **510** such as a bolt, that can be removed to adjust the length of the upright column **110** and foot **500** to level the frame tent system **100** for example. The foot **500** can be a flat plate with openings **520** for a stake (not shown) for example.

FIG. **6** shows a corner eave weldment **600** which can include a plate **620** having a first end **640** and a second end **660**. Insert tubes **630**A and **630**B can be welded to the plate **620** at 45 degree angles to form a 90 degree corner of the eave of frame tent system **100**.

FIGS. **7**A and **7**B show the ridge weldment **700** connecting rafters **130** from opposite sides of the frame tent system **100**. The ridge weldment **700** can include a cable attached dowel pin **734**. Cable attached dowel pins **734** can be used on each weldment **10**, **600**, **700**. The ridge weldment **700** can include hangers **710**, **712** that allow a user to hang items (not shown) such as lights, for example, inside the frame tent system **100**.

FIGS. **8**A and **8**B show a typical connection **800** between frame members **110**, **120**, and **130** shown particularly cut away for clarity. As can be seen, dowel pins **734** can be used to secure frame members **110**, **120**, **130** to the weldment **10** through the weight of the system **100** and could hold the weldment **10** in the upright column **110**.

Although the description above contains many specificities, these should not be construed as limiting the scope of the invention but as merely providing illustrations of some of the presently preferred embodiments of this invention.

It will be obvious to those skilled in the art that modifications may be made to the embodiments described above without departing from the scope of the present invention. Thus the scope of the invention should be determined by the appended claims in the formal application and their legal equivalents, rather than by the examples given.

We claim:

1. A frame tent system comprising:

a plurality of upright columns, eave members, and rafters;

eave weldments for inter-connecting the columns, eave members and rafters;

wherein the eave weldment comprising a weldment plate;

wherein the weldment plate including a first end and a second end;

wherein the eave weldment further includes at least one insert tube, said insert tube including a stop disposed on a surface, and a pin hole disposed through the surface on opposite ends of the insert tube;

dowel pins attached to a side surface of the insert tube, said insert tube sized to fit frictionally in said eave member;

wherein said ends of the weldment plate sized to fit frictionally in said upright columns and said rafters.

2. The frame tent system as recited in claim **1**, wherein each of the columns, eave members, and rafters include a common channel interior cross section for receiving said ends of the weldment plate, and receiving said at least one insert tube.

3. The frame tent system as recited in claim **1**, wherein said first and second ends of the weldment plate each having a pair of bushings and a pair of spacers.

4. The frame tent system as recited in claim **1**, wherein the at least one insert tube is generally perpendicular to said weldment plate.

5. The frame tent system as recited in claim **1**, wherein the eave weldments are constructed of steel plate having a thickness of 5/8".

6. A frame tent system comprising:

a plurality of upright columns, eave members, and rafters;

eave weldments for inter-connecting the columns, eave members and rafters;

wherein the eave weldment includes a weldment plate and at least one insert tube;

wherein the weldment plate including a first end and a second end, said first and second end each having a pair of bushings and a pair of spacers;

wherein the insert tube including a pair of stops disposed on a surface, and a pin hole disposed through the surface on opposite ends of the insert tube;

dowel pins attached to a side surface of the insert tube;

wherein an end of the rafter receives the first end of the weldment plate;

wherein an end of the upright column receives the second end of the weldment plate; and

wherein an end of the eave member receives the insert tube.

7. The frame tent system as recited in claim **6**, wherein each of the columns, eave members, and rafters include a channel for receiving the ends of the weldment plate and the insert tube.

8. The frame tent system as recited in claim **7**, wherein the bushings and the spacers of the first and second ends of the weldment plate are slidingly received within the channel of the upright column and the rafters so that flattened end surfaces of the bushings and spacers are in frictional communication with an interior surface of the channel.

9. The frame tent system as recited in claim **6**, wherein the weldment plate is constructed of steel plate having a thickness of 5/8".

10. A frame tent system comprising:

a plurality of upright columns, eave members, and rafters, wherein each of the upright columns, eave members, and rafters include a common channel interior cross section;

eave weldments for inter-connecting the columns, eave member and rafters;

wherein the eave weldment includes a weldment plate and at least one insert tube;

wherein the weldment plate includes a first end and a second end, said first and second end each having a pair of bushings and a pair of spacers adapted to be frictionally received in said common channel interior cross section;

wherein said at least one insert tube is sized to fit frictionally in said common channel interior cross section such that said eave weldment forms a joint between at least one of each of said rafters, upright columns, and eave members.

11. The frame tent system as recited in claim **10**, wherein holes pass through ends of said rafters, upright columns and eave members such that pins pass through said holes and into said bushings to lock said rafters, upright columns and eave members to said eave weldment.

12. The frame tent system as recited in claim **11**, wherein said eave weldment includes a clearance receiving a tie down to secure said tent frame to the ground.

13. The frame tent system as recited in claim **11**, wherein said eave weldment includes stops to position said eave members on said eave weldment.

14. The frame tent system as recited in claim **10**, wherein said eave weldment includes a second insert tube, wherein said second insert tube is axially aligned with said at least one insert tube.

15. The frame tent system as recited in claim **10**, wherein said at least one insert tube is generally perpendicular to said weldment plate.

16. A tent system comprising:

at least one upright column, at least one eave member, and at least one rafter each having a common channel section;

a weldment for inter-connecting the column, eave member and rafter;

wherein the weldment including a first end and a second end and at least one insert tube, said first end including at least two bushings frictionally received in said common channel section of said upright column and said second end including at least two bushings frictionally received in said common channel section of said rafter;

wherein said at least one insert tube is sized to fit frictionally with said common channel section of said at least one eave member to inter-connect said at least one rafter, upright column and eave member.

17. The tent system as recited in claim **16**, including a foot section received in the common channel section of said upright column.

18. The tent system as recited in claim **16**, wherein the common channel section runs an entire length of each of said upright column, said eave member and said rafter.

19. The tent system as recited in claim **18**, wherein holes pass through ends of said rafter, upright column and eave member such that pins pass through said holes to lock said rafter, upright column and eave member to said weldment.

20. The tent system as recited in claim **18**, wherein a first width in said common channel section defines a first rectangular opening and a second width in said common interior cross section defines a second rectangular opening.

21. The tent system as recited in claim **20**, wherein the first width and the second width are sized to frictionally receive said weldment.

22. A tent system comprising:

at least one upright column, at least one eave member, and at least one rafter each having a common channel cross section;

a connector for inter-connecting the column, eave member, and rafter;

wherein the connector including a first end and a second end, said first end includes at least two bushings frictionally received in said common channel cross section of said upright column and said second end includes at least two bushings frictionally received in said common channel cross section of said rafter;

wherein a portion of said connector is sized to fit frictionally with said common channel cross section of said eave such that said connector inter-connects said at least one rafter, upright column and eave member and wherein the common channel cross section runs an entire length of the at least one eave, upright column and rafter members.

23. The tent system as recited in claim **22**, wherein said at least one rafter is pinned to said connector with a dowel pin.

24. The tent system as recited in claim **22**, wherein a base section including a foot plate fits into said common channel section of said upright column.

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